What is claimed:

1. A medical signal processing method, comprising the steps of:

receiving time-based information corresponding to a defined time interval of a time-based, medical diagnostic signal;

performing a transform on said time-based information to obtain a frequency spectrum defined by a set of nonzero amplitude values for a corresponding set of frequencies, said frequency spectrum including a number of said nonzero amplitude values at irregularly spaced frequency intervals, wherein said nonzero amplitude values include a first nonzero amplitude value at a first frequency value and a second nonzero amplitude value greater than said first nonzero amplitude value at a second frequency and said second frequency is a noninteger multiple of each frequency of said set of frequencies other than said second frequency; and

operating a processor in a signal processing environment for using said transform to provide an output based on said time-based, medical diagnostic signal.

2. A method as set forth in Claim 1, wherein said time-based signal includes a component having a period that is longer than said time interval.

3. A method as set forth in Claim 2, wherein said period of said component is at least twice said time interval.

4. A method as set forth in Claim 1, wherein said step of receiving comprises obtaining an input based on a transmitted interrogation signal.

5. A method as set forth in Claim 1, wherein said step of receiving comprises obtaining an input based on a transmitted ultrasound signal.

6. A method as set forth in Claim 1, wherein said spectrum includes first, second and third successive nonzero values associated with first, second and third successive frequencies, where a difference between said first and second frequencies is different than a difference between said second and third frequencies.

7. A method as set forth in Claim 1, wherein said spectrum defines a substantially continuous function across a frequency range wherein said function has nonzero values for a majority of frequencies of said range.

8. A method as set forth in Claim 1, wherein said step of operating comprises using said spectrum to modify said time-based signal on a frequency dependent basis.

9. A method as set forth in Claim 1, wherein said step of operating comprises using said spectrum to calculate at least one parameter based on said time-based signal.

10. A method as set forth in Claim 1, wherein said time-based signal is an ultrasound signal modulated based on interaction with tissue of an organism including a flow channel and said step of operating comprises determining dimension related information for said flow channel.

11. A method as set forth in Claim 1, wherein said time-based signal is an analog signal and said time-based information is digital time-based information, and said step of performing a transform involves accounting for a digitization error associated with a difference between said analog time-based signal and said digital time-based information.

12. A method as set forth in Claim 11, wherein said digital time-based information comprises a time series of digital values and said accounting involves defining a number of value ranges associated with said digital values, establishing a mathematical model defining a process for deriving said spectrum wherein a given digital value of said series of digital values is allowed to vary within one of said number of value ranges including said given digital value as part of said process, and using said mathematical model to derive said spectrum.

13. A method as set forth in Claim 12, wherein a determination process for determining a specific value of said given digital value within said one value range involves modeling said determination process as a constrained optimization problem.

14. A method as set forth in Claim 13, wherein said optimization problem involves a constraint related to a limit of said range.

15. A method as set forth in Claim 13, wherein said optimization problem involves upper and lower constraints related to limits of said range.

16. A method as set forth in Claim 13, wherein said optimization problem involves a nonnegativity constraint.

17. A method as set forth in Claim 13, wherein said optimization problem involves a constraint related to a limit of said range and a nonnegativity constraint.

18. A method as set forth in Claim 13, wherein said optimization problem includes a constraint related to a peak count within said range.

19. A method as set forth in Claim 13, wherein said optimization problem is defined by a convex objective function.

20. A method as set forth in Claim 13, wherein said optimization problem involves at least one constraint, and said constraint is implemented by one of a penalty function and a barrier function.

21. A method as set forth in Claim 20, wherein said constraint is implemented by a Heaviside function.

22. A method as set forth in Claim 21, wherein said Heaviside function is tapered at an area corresponding to a constraint value such that the function is free from singularities at said area.

23. A method as set forth in Claim 11, wherein said accounting comprises establishing a mathematical model for imposing at least one constraint on a function associated with said spectrum.

24. A method as set forth in Claim 23, wherein said constraint relates to a length of said function within a defined frequency range.

25. A method as set forth in Claim 23, wherein said constraint relates to an area underlying said function within a defined frequency range.

26. A method as set forth in Claim 23, wherein said constraint requires that said function have non-negative values within a defined frequency range.

27. A medical signal processing method, comprising the steps of:

receiving time-based information corresponding to a defined time interval of a time-based, medical diagnostic signal;

performing a transform on said time-based information to obtain a frequency spectrum, said frequency spectrum including a first pair of first and second successive nonzero amplitude values associated with first and second successive frequencies, and a second pair of third and fourth successive amplitude values associated with third and fourth successive frequencies, where a difference between said first and second frequencies is different than a difference between said third and fourth frequencies; and

operating a processor in a signal processing environment for using said transform to provide an output based on said time-based, medical diagnostic signal.

28. A medical signal processing method as set forth in Claim 27, wherein each of said first and second frequencies is different than each of said third and fourth frequencies.

29. A method as set forth in Claim 27, wherein said time-based signal includes a component having a period that is longer than said time interval.

30. A method as set forth in Claim 27, wherein said period of said component is at least twice said time interval.

31. A method as set forth in Claim 27, wherein said step of receiving comprises obtaining an input based on a transmitted interrogation signal.

32. A method as set forth in Claim 27, wherein said step of receiving comprises obtaining an input based on a transmitted ultrasound signal.

33. A method as set forth in Claim 27, wherein said spectrum defines a substantially continuous function across a frequency range wherein said function has nonzero values for a majority of frequencies of said range.

34. A method as set forth in Claim 27, wherein said time-based signal is an analog signal and said time-based information is digital time-based information, and said step of performing a transform involves accounting for a digitization error associated with a difference between said analog time-based signal and said digital time-based information.

35. A medical signal processing method, comprising the steps of:

receiving time-based information corresponding to a defined time interval of a time-based, medical diagnostic signal, wherein said time-based signal includes a component having a period that is at least twice said time interval;

performing a transform on said time-based information to obtain a frequency spectrum for said time-based signal; and

operating a processor in a signal processing environment for using said transform to provide an output based on said time-based, medical diagnostic signal.

36. A method as set forth in Claim 35, wherein said step of receiving comprises obtaining an input based on a transmitted interrogation signal.

37. A method as set forth in Claim 35, wherein said step of receiving comprises obtaining an input based on a transmitted ultrasound signal.

38. A method as set forth in Claim 35, wherein said spectrum includes first, second and third successive nonzero values associated with first, second and third successive frequencies, where a difference between said first and second frequencies is different than a difference between said second and third frequencies.

39. A method as set forth in Claim 35, wherein said spectrum defines a substantially continuous function across a frequency range wherein said function has nonzero values for a majority of frequencies of said range.

40. A method as set forth in Claim 35, wherein said time-based signal is an analog signal and said time-based information is digital time-based information, and said step of performing a transform involves accounting for a digitization error associated with a difference between said analog time-based signal and said digital time-based information.

41. A medical signal processing method, comprising the steps of:

receiving time-based, medical diagnostic information corresponding to a defined time interval of a time-based signal;

performing a transform on said time-based information to obtain a frequency spectrum for said time-based signal, wherein said spectrum defines a substantially continuous function across a frequency range wherein said function has nonzero values for a majority of frequencies of said range; and

operating a processor in a signal processing environment for using said transform to provide an output based on said time-based, medical diagnostic signal.

42. A method as set forth in Claim 41, wherein said time-based signal includes a component having a period that is longer than said time interval.

43. A method as set forth in Claim 41, wherein said period of said component is at least twice said time interval.

44. A method as set forth in Claim 41, wherein said step of receiving comprises obtaining an input based on a transmitted interrogation signal.

45. A method as set forth in Claim 41, wherein said spectrum includes first, second and third successive nonzero values associated with first, second and third successive frequencies, where a difference between said first and second frequencies is different than a difference between said second and third frequencies.

46. A method as set forth in Claim 41, wherein said time-based signal is an analog signal and said time-based information is digital time-based information, and said step of performing a transform involves accounting for a digitization error associated with a difference between said analog time-based signal and said digital time-based information.

47. A medical signal processing method, comprising the steps of:

receiving time-based, medical diagnostic information corresponding to a defined time interval of a time-based signal, wherein said time-based signal is an analog signal and said time-based information is digital time-based information;

performing a transform on said time-based information to obtain a frequency spectrum for said time-based signal;

said step of performing a transform involving accounting for a digitization error associated with a difference between said analog time-based signal and said digital time-based information; and

operating a processor in a signal processing environment for using said transform to provide an output based on said time-based, medical diagnostic signal.

48. A method as set forth in Claim 47, wherein said digital time-based information comprises a time series of digital values and said accounting involves defining a number of value ranges associated with said digital values, establishing a mathematical model

defining a process for deriving said spectrum wherein a given digital value of said series of digital values is allowed to vary within one of said number of value ranges including said given digital value as part of said process, and using said mathematical model to derive said spectrum.

49. A method as set forth in Claim 48, wherein a determination process for determining a specific value of said given digital value within said one value range involves modeling said determination process as a constrained optimization problem.

50. A method as set forth in Claim 49, wherein said optimization problem involves a constraint related to a limit of said range.

51. A method as set forth in Claim 49, wherein said optimization problem involves upper and lower constraints related to limits of said range.

52. A method as set forth in Claim 49, wherein said optimization problem involves a nonnegativity constraint.

53. A method as set forth in Claim 49, wherein said optimization problem involves a constraint related to a limit of said range and a nonnegativity constraint.

54. A method as set forth in Claim 49, wherein said optimization problem includes a constraint related to a peak count within said range.

55. A method as set forth in Claim 49, wherein said optimization problem is defined by a convex objective function.

56. A method as set forth in Claim 49, wherein said optimization problem involves at least one constraint, and said constraint is implemented by one of a penalty function and a barrier function.

57. A method as set forth in Claim 56, wherein said constraint is implemented by a Heaviside function.

58. A method as set forth in Claim 57, wherein said Heaviside function is tapered at an area corresponding to a constraint value such that the function is free from singularities at said area.

59. A medical signal processing system, comprising:

a port for receiving time-based information corresponding to a defined time interval of a time-based, medical diagnostic signal; and

a processor for:

1) performing a transform on said time-based information to obtain a frequency spectrum defined by a set of nonzero amplitude values for a corresponding set of frequencies, said frequency spectrum including a number of said nonzero amplitude values at irregularly spaced frequency intervals, wherein said nonzero amplitude values include a first nonzero amplitude value at a first frequency value and a second nonzero amplitude value greater than said first nonzero amplitude value at a second frequency and said second frequency is a noninteger multiple of each frequency of said set of frequencies other than said second frequency, and

2) using said transform to provide an output based on said time-based, medical diagnostic signal.

60. A system as set forth in Claim 59, wherein said port is operative for obtaining an input based on a transmitted interrogation signal.

61. A system as set forth in Claim 59, wherein said processor is operative for accounting for a digitization error associated with a difference between said analog time-based signal and said digital time-based information.

62. A medical signal processing system, comprising:

a port for receiving time-based information corresponding to a defined time interval of a time-based, medical diagnostic signal, wherein said time-based signal includes a component having a period that is at least twice said time interval; and

a processor operative for performing a transform on said time-based information to obtain a frequency spectrum for said time-based signal and using said transform to provide an output based on said time-based, medical diagnostic signal.

63. A medical signal processing system, comprising the steps of:

a port for receiving time-based information corresponding to a defined time interval of a time-based, medical diagnostic signal; and

a processor operative for performing a transform on said time-based information to obtain a frequency spectrum for said time-based signal, wherein said spectrum defines a substantially continuous function across a frequency range wherein said function has nonzero values for a majority of frequencies of said range and using said transform to provide an output based on said time-based signal.

64 A medical signal processing system comprising:

a port for receiving time-based information corresponding to a defined time interval of a time-based, medical diagnostic signal, wherein said time-based signal is an analog signal and said time-based information is digital time-based information; and

a processor operative for:

1) performing a transform on said time-based information to obtain a frequency spectrum for said time-based signal wherein said step of performing a transform involving accounting for a digitization error associated with a difference between said analog time-based signal and said digital time-based information; and

2) operating a processor in a signal processing environment for using said transform to provide an output based on said time-based signal.

65. A systemas set forth in Claim 64, wherein said processor is operative for implementing a determination process for determining a specific value of a given digital

value within a value range by modeling said determination process as a constrained optimization problem.

66. A system as set forth in Claim 65, wherein said optimization problem involves a constraint related to a limit of said range.

67. A system as set forth in Claim 65, wherein said optimization problem involves upper and lower constraints related to limits of said range.

68. A system as set forth in Claim 65, wherein said optimization problem involves a nonnegativity constraint.

69. A system as set forth in Claim 65, wherein said optimization problem involves a constraint related to a limit of said range and a nonnegativity constraint.

70. A system as set forth in Claim 65, wherein said optimization problem includes a constraint related to a peak count within said range.

71. A system as set forth in Claim 65, wherein said optimization problem is defined by a convex objective function.

72. A system as set forth in Claim 72, wherein said optimization problem involves at least one constraint, and said constraint is implemented by one of a penalty function and a barrier function.

73. A system as set forth in Claim 72, wherein said constraint is implemented by a Heaviside function.

74. A system as set forth in Claim 73, wherein said Heaviside function is tapered at an area corresponding to a constraint value such that the function is free from singularities at said area.

75. A medical signal processing method, comprising the steps of:

receiving information corresponding to a detected medical diagnostic signal;

establishing an amplitude function corresponding to said detected medical diagnostic signal as a vector of discrete frequencies starting at a selectable frequency of interest; and

operating a processor in a signal processing environment for using said amplitude function to provide an output based on said medical diagnostic signal.

76. A medical signal processing method as set forth in Claim 75, wherein said selectable frequency of interest is selected based on the frequency of an interrogating signal that produces said medical diagnostic signal.

77. A medical signal processing method as set forth in Claim 75, wherein said selectable frequency of interest is selected based on the lowest frequency expected from the medical diagnostic signal.

78. A medical signal processing method, comprising the steps of:

receiving information corresponding to a detected medical diagnostic signal;

establishing an amplitude function corresponding to said detected medical diagnostic signal as a vector of discrete, irregularly spaced frequencies; and

operating a processor in a signal processing environment for using said amplitude function to provide an output based on said medical diagnostic signal.

79. A medical signal processing method, comprising the steps of:

receiving information corresponding to a detected medical diagnostic signal;

establishing an amplitude function corresponding to said detected medical diagnostic signal as a plurality of non-orthogonal functions; and

operating a processor in a signal processing environment for using said amplitude function to provide an output based on said medical diagnostic signal.

80. A medical signal processing method, comprising the steps of:

receiving information corresponding to a detected medical diagnostic signal;

establishing an amplitude function corresponding to said detected medical diagnostic signal as a plurality of non-normalized functions; and

operating a processor in a signal processing environment for using said amplitude function to provide an output based on said medical diagnostic signal.

81. A medical signal processing method, comprising the steps of:

receiving information corresponding to a detected medical diagnostic signal;

establishing an amplitude function corresponding to said detected medical diagnostic signal as a plurality of functions that are one of continuous and piecewise continuous; and

operating a processor in a signal processing environment for using said amplitude function to provide an output based on said medical diagnostic signal.

82. A medical signal processing method as set forth in Claim 81, wherein said functions include one or more of splines, B-splines, polynomials of order/or greater, trigonometric functions, trigonometric polynomials or exponential functions that span one or more predetermined vector spaces.

83. A medical signal processing method as set forth in Claim 81, wherein said functions are piecewise continuous.

84. A medical signal processing method as set forth in Claim 83, wherein said functions are one of linear or quadratic.

85. A medical signal processing method as set forth in Claim 83, wherein said functions have an order less than 10.

86. A medical signal processing method, comprising the steps of:

receiving information corresponding to a detected medical diagnostic signal;

establishing an amplitude function based on the detected medical diagnostic signal using a least squared error function, where the least squared error function is modeled as a quadratic programming problem with constraints on the values of one or more variables; and

operating a processor in a signal processing environment for using said amplitude function to provide an output based on said medical diagnostic signal.

87. A medical signal processing method as set forth in Claim 86, wherein said constraints include constraining one or more values to be positive.

88. A medical signal processing method as set forth in Claim 86, wherein said constraints include constraining one or more variables to have a particular relationship to one or more other variables.

89. A medical signal processing method, comprising the steps of:

receiving information corresponding to a detected medical diagnostic signal;

establishing an amplitude function based on the detected medical diagnostic signal using a least absolute value function, where the least absolute value function is modeled as a linear program with constraints on the values of one or more variables; and

operating a processor in a signal processing environment for using said amplitude function to provide an output based on said medical diagnostic signal.

90. A medical signal processing method as set forth in Claim 89, wherein said constraints include constraining one or more values to be positive.

91. A medical signal processing method as set forth in Claim 89, wherein said constraints include constraining one or more variables to have a particular relationship to one or more other variables.

92. A medical signal processing method, comprising the steps of:

receiving time-based information corresponding to a defined time interval of a time-based, medical diagnostic signal;

performing a transform on said time-based information to obtain a frequency spectrum defined by a set of nonzero amplitude values for a corresponding set of frequencies, wherein the number of amplitude values of said set and said frequencies are predetermined; and

operating a processor in a signal processing environment for using said transform to provide an output based on said time-based, medical diagnostic signal.

93. A medical signal processing method as set forth in Claim 92, wherein said frequencies are the knotpoint frequencies for piecewise continuous functions defining said spectrum.

94. A medical signal processing method as set forth in Claim 92, further comprising the step of precalculating solution matrices related to said predetermined frequencies for use in one of said performing and operating steps.

95. A medical signal processing method as set forth in Claim 20, wherein a single function incorporates penalties for both a lower constraint limit value and an upper constraint limit value.